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5-year links of SOC losses and CO_2 fluxes in case of constructed lawn topsoil

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The regulation of greenhouse gas fluxes in the terrestrial ecosystems is one of the main environmental functions of the soil. Typically, 60-80% of the terrestrial CO_2 emissions are of soil origin. In case of urban lawn ecosystems, this soil function is especially important, because their soil organic carbon (SOC) has increased spatial and temporal variability that influence on the lawn quality and CO_2 emission.
In case of a 5-year (2012-2017) field experiment conducted at the Field Experimental Station in the Moscow campus of the Timiryazev State Agrarian University, 28 containers with different man-made topsoil composition and construction have been analyzed with CO_2 fluxes seasonal monitoring.
During first year of the monitoring, the maximum CO_2 emissions were observed in topsoil versions with 20-cm peat horizons (up to 7.7 kg / m2 CO_2). In 2 years of experiment running, their topsoil lost up to 70.9% of the primary organic C with maximum losses during unusual for native peat conditions dry warm periods. There are close correlations of CO_2 emission with soil temperature (positive R up to 0.89) and soil moisture (negative R up to -0,82). After this SOC stocks have been gradually stabilized with still essential differences between originally contrast version in the grass bio-productivity, soil bulk density and SOC content in 3 and even 5 years of the experiment.
5-year results allowed us to select 10-cm sandy and sandy-loam peat horizon versions as best ones for field experiments with 10 m2 plots. Additional versions with 5-cm sandy and sandy-loam peat horizons and different fertilizing techniques will help to improve the lawn sustainability with less environmental risks and economic costs. Moscow Government renovation program determines the growing interest in this kind of green infrastructure optimizing solutions.